

AVOCADO PRODUCTION

Perla S. Estellena

Avocado (*Persea americana* Mill.) known as 'aguacate' in Spanish , 'alligator pear', 'Palta pear', 'Midshipman's butter', 'avocado' in English, and 'abokado' in the Philippine vernacular belongs to family Lauraceae; hence it is related to the cinnamon tree, camphor, and sassafras. It is considered as one of the most nutritious fruit in the world.

GENERAL DESCRIPTION OF THE CROP

In the Philippines, two distinct types of avocado exist, namely the green-fruited and the purple-fruited types however, the purple-fruited varieties are preferred by the consumers. Table 1 shows the country's average from 2005-2010 area planted with avocado, number of bearing trees and the volume of production by region

Table 1. Area Planted with Avocado, Number of Bearing Trees and Production by Region (mean of 2005-2010 figures from BAS).

Region	Area (ha)	Number of bearing trees	Production (tons)
CAR	225	21,690	1,292
Ilocos	240	25,165	1,882
Cagayan Valley	788	95,869	5,573
Central Luzon	172	18,146	588
CALABARZON	503	65,627	1,557
MIMAROPA	284	27,097	1,724
Bicol Region	818	82,759	1,396
Western Visayas	460	45,851	999
Central Visayas	434	39,390	3,469
Eastern Visayas	150	16,226	656
Western Mindanao	427	20,206	881
Northern Mindanao	201	14,925	750
Southern Mindanao	139	14,923	1,244
Central Mindanao	120	8,577	340
CARAGA	376	32,559	869
ARMM	89	8,391	1,330
Total	5,426	537,401	24,550

Usages of the Crop and Nutritional Profile

Creamy rich avocado is considered the world's healthiest fruit, because of its nutrient contents such as vitamin K, dietary fiber, potassium, folic acid, vitamin B6, vitamin C, copper, and reasonable calories in it (Table 2).

Table 2. Nutritional facts per 150 g avocado flesh.
Nutritional facts from 150g of avocado flesh (Lifestylekarma, 2012)

Nutrient	Amount
Protein	3.0 g
Potassium	727mg
Calories	240 g
Carbohydrates	12.8 g
Vitamin K	31.50 mcg
Vitamin A	219 IU
Folate	122 mg
Dietary fiber	10.1 g
Vitamin C	15 mg
Vitamin E	3.1 mg
Vitamin B6	0.4 mg

Medicinal Uses

The fruit skin is antibiotic; is employed as a vermifuge and remedy for dysentery. The leaves are chewed as a remedy for pyorrhea. Leaf poultices are applied on wounds. Heated leaves are applied on the forehead to relieve neuralgia. The aqueous extract of the leaves has a prolonged hypertensive effect. The leaf decoction is taken as a remedy for diarrhea, sore throat and hemorrhage; it allegedly stimulates and regulates menstruation. It is also drunk as a stomachic. In Cuba, a decoction of the new shoots is a cough remedy. If leaves, or shoots of the purple-skinned type, are boiled, the decoction serves as an abortifacient. The seed is cut in pieces, roasted and pulverized and given to overcome diarrhea and dysentery. The powdered seed is believed to cure dandruff. A piece of the seed, or a bit of the decoction, put into a tooth cavity may relieve toothache. An ointment made of the pulverized seed is rubbed on the face as a rubefacient—to redden the cheeks. An oil extracted from the seed has been applied on skin eruptions.

VARIETIES

Avocado is botanically divided into 3 races: Mexican, West Indian and Guatemalan.

Table 3. List of avocado varieties approved by the Philippine National Seed Industry Council (NSIC).

Name	Characteristics
1. NSIC 95-Av-02 (Parker) (Fig. 1)	Prolific yielder, (500-700 fruits/season) bear fruit both during the late season & off season; fruit of excellent eating quality, possessing flesh texture (smooth & firm) w/ scanty fiber with flavor buttery & nutty; high edible portion of 87.0%. a fruit weighs 561.4 g
2. NSIC 97-Av-03 (RCF Morado)	Yield, 300-400 fruits/season. Significant small seed (about 9% of the total fruit weight skin easily peels off; testa does not adhere to the flesh with high edible portion (80.8%). A fruit weighs 391.5 g
3. Cepillo Green (Fig. 2)	The fruit pyriform and weighing 700 grams. The skin is green and intermediate in thickness (0.9 mm). The seed is intermediate in size (90 g). The flesh is dark yellow and is 80% of the whole fruit by weight.

These are the NSIC-accredited avocado varieties

NSIC 1995 Av08	Salcedo	Alejandro Tabayocyoc, Bua-bua, Salcedo, Eastern Samar
NSIC 1995 Av05	Cepillo Green	Atty. Gualberto Cepillo, Balagtas, Batangas City
NSIC 1995 Av09	Rambu	Isabelo Ramos, 1 Banna, Ilocos Norte
PSB 1991 Av1	De Leon	Jose de Leon, Talisay, Batangas
PSB 1991 Av2	Calma	Jose de Leon, Talisay, Batangas
PSB 1991 Av3	Tacloban Selection	Ma. Elisa A Pernejo, Juan Luna St., Tacloban City
NSIC 1995 Av06	Parker	Robert Parker, Limcauco St., Cabuyao, Laguna
NSIC 1995 Av07	RCF Morado	Roberto Coronel, Mt. Makiling St., Los Baños, Laguna
PSB 1992 Av4	Bat-Av-0-3 or Bat-000192	Teodoro V. Katigbak, Malabanan, Balete, Batangas

Other avocado varieties in the country are the 'Cardinal', 'Calma', 'Uno', Accession 240, and Accession 227.

CULTURE AND MANAGEMENT

Soil and Climatic Requirements

Soil – it can be grown over a wide range of soil types provided with adequate drainage. For best production, deep, fertile, well-drained soils, particularly sandy or alluvial loam soils and have a pH of neutral or slightly acid are suited for avocado.

Climate – a climate with alternating wet and dry season and with minimum annual rainfall requirement of 750 – 1,000 mm is recommended.

It does not thrive well in places exposed to strong, excessively hot and dry winds.

Elevation - Generally, avocado can grow well from sea level to about 1,500 m in places with short or no dry season. Where dry season exceeds 4 to 5 months, irrigation is very important.

Seed Selection and Germination – seed used should be obtained from healthy and vigorous trees. Select large seeded fruits especially when intended for root-stocks to maintain seedling quality. It is recommended to plant it at once. If in case it cannot be planted/propagated immediately, store it in the moist sand or sphagnum moss. Seeds are sown with the pointed ends up and with about one-fourth of their length above soil level. Germination starts 2-3 weeks from planting or sowing.

Care of Seedlings – the seedlings planted in containers should be provided with temporary shade. Direct exposure to sunlight may injure the seeds and the emerging one. Water the seedlings regularly and if the need arises, spray it with the recommended dosages of pesticides to control pests.

Propagation – avocado can be propagated either sexually (by seeds) or asexually (by marcotting, inarching, grafting, and budding). However, propagation through seeds is not recommended for the resulting plants do not come true-to-type.

- a. **Marcotting.** This is an option, however, it is laborious, slow and some varieties do not respond well to this method. Besides, it takes 4 to 5 months of marcot to produce roots.
- b. **Inarching.** It gives a very high percentage of success as good results can be obtained in both dry and wet seasons. A relatively slow process, it takes 8 to 62 weeks or more to separate the inarches from the tree. Inarching is recommended for small scale propagation only.
- c. **Cleft Grafting.** This is recommended for larger scale propagation. Use rootstock about 6 to 12 months old with a stem as large as pencil. Select mature budstick with a well-developed terminal buds.
- d. **Shield Budding.** It is also recommended for larger propagation. This method is fast and resulting plants are precarious, low spreading and uniform. Seedling stock for this purpose should be about 23 – 30 cm tall and its stem is pencil-size. Select mature budwood to facilitate easy bending.

LAND PREPARATION

Backyard Planting – dig a hole wide and large enough to accommodate the ball of the planting material.

Orchard Plantation – prepare the land thoroughly by plowing 2 to 3 times followed by two or more harrowing until good tilt is attained. Stake the field with the recommended distance of planting.

Planting – transplant the planting materials when they are about 50 cm tall. The recommended distance of planting is 9 meters apart accommodating 125 seedlings per hectare. Align the trees in all directions and finally pack the base of the plant to let the root system recover early.

Planting can be done anytime of the year but the best time is during the onset of the rainy season. If planted during dry season provide the seedlings with irrigation and partial shade.

Irrigation - Young trees (2-3 years old) are very sensitive to heat and water should be given regularly (every two weeks).

Fertilization - in the absence of soil analysis, the general recommendation is to apply 100-200g ammonium sulfate or 50-100g urea per tree one month after planting. Apply the same amount six months thereafter. Reduce the recommendation when supplemented with manure or compost. Apply 500g of 14-14-14 per tree twice a year at the start of fruiting. For full bearing trees (15-20 years old) at least 2kg complete fertilizer per tree per year. Half the amount should be applied at the start of the rainy season and the other half at the end of the season.

Pruning - Requires little training but decayed or dead braches should be removed. Varieties with vertical growth can be pruned to encourage horizontal growth, however, it should be minimized when the trees start to bear fruits.

Intercropping and covercropping - use vacant spaces in between the main crop by planting bananas, papaya, pineapple, vegetables, cereals and other short-season crops. Replace it with leguminous cover crops when intercropping is no longer feasible.

Pests and diseases control

Pest / Diseases	Plant Parts / Storage of Growth Attacked	Control Measures
A. Insect Pests		
1. Mango Leafhoppers	Young shoots and flowers	Spray Confidor, Trebon, Karate, Decis
2. Tip borer	Young shoots and flowers	Spray Trebon, Sherpa, Cymbush, Decis, Karate
3. Scale insects	Stem, branches & leaves	Prune severely infected branches; spray banana oil; Baythroid
4. Capsid bug	Fruits	Spray Baythroid, Trebon, Decis
5. Fruit fly	Fruits	Bagging of fruits
B. Diseases		
1. Anthracnose	Leaves, flowers & fruits	Spray Benlate, Captan, Dithane M-45, Antracol and hot water treatment of matured fruits
2. Stem-end rot	Fruits	Hot water treatment of matured fruits
3. Scab	Fruits	Hot water treatment of matured fruits
4. Pink disease	Trunks & branches	Spray copper fungicide; Antracol, Captan
5. Root rot	Roots	Scrape infected parts & paint copper fungicide Avoid planting in waterlogged areas.

Disclaimer: The mention of trade name of the pesticides does not mean an endorsement of the product or prejudice to other brands.

Other Notes for the author- (1) try to find organic pesticides that can be used in preventing and or controlling the major insect pest and diseases of avocado.

Harvesting

Fruit maturity is indicated by the appearance of reddish- streaks on stem-end (purple varieties), change in color from green to light green in green varieties and production of a hollow sound when tapped with fingers. Harvesting should be done using a picking pole with a wire hook and a net basket attached to its end to avoid injury of fruits.

Fruits should be placed in basket or box lined with packing materials (dried straw, banana leaves) for local market or individually wrapped with soft paper and packed in single layered boxes for long distance shipment.

Costs and Return

Given the proper care and management, avocado trees bear fruits 4 years from field planting. The estimated cost of producing the planting materials, field establishment and management up to marketing is shown in Appendix 1a-1b. The estimated volume of production of avocado per tree, productivity per hectare and the value of production per hectare is shown in Table 4.

Table 4. Estimated volume of production of avocado per tree, productivity per hectare and value of production per hectare.

Year	Productivity/Tree (No. Of fruits)	Productivity per Hectare		% Marketable Fruit (kgs)	Gross Value of Production (P)
		(No. of fruits)	(kgs)		
4	30	3,750	2,063	1,857	27,855.00
5	70	8,750	4,813	4,332	64,980.00
6	120	15,000	8,250	7,425	111,375.00
7	200	25,000	13,750	12,375	185,625.00
8	300	37,500	20,625	18,563	278,445.00
9	400	50,000	27,500	24,750	371,250.00
10	500	62,500	34,375	30,938	464,070.00

Assumptions:

1. 125 trees/ha
2. Bearing stage starts at year 4
3. Average weight of fruit = 550g/fruit
4. 10% non-marketable fruits or rejects
5. Farm gate price = P15.00/kg

Table 5 shows the costs and return of a one-hectare avocado orchard. No income is expected from year 1 to year 3. The orchard is expected to start generating a little income on Year 4 and boosts on the succeeding years provided that proper care and maintenance is employed.

References:

Bureau of Plant and Industry- title, author, and year?

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Potential for avocado production development in the Philippines.